X-Plain™
Microelectrode-Guided Pallidotomy for Parkinson's Disease
Reference Summary

Parkinson's disease affects more than a million Americans.

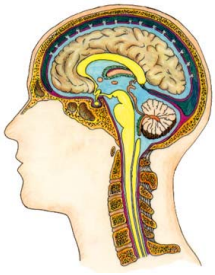
The realization that many Parkinson's patients continue to be disabled despite the best available medical therapy, has prompted a search for alternative treatment strategies.

The main treatment for Parkinson's disease, or PD, is medical, using oral medications. A surgery known as pallidotomy may be necessary in some cases to help control some of the symptoms of PD.

This reference summary will help you better understand the proposed procedure, as well as the potential risks and complications.

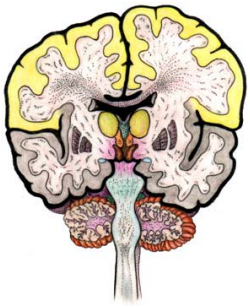
Anatomy
The brain controls all body functions, from speech to movement and thinking.

It is located in and protected by the skull.



MRIs (Magnetic resonance imaging scans) and CAT scans (Computed axial tomography) are routinely used by doctors to look at the brain.

Symptoms and Their Causes
Parkinson's disease (PD), is a degenerative disease of the brain. A group of cells deep in the brain, in an area known as 'substantia nigra', dies off. These cells produce a very important substance called dopamine.



Dopamine is necessary to help the brain control body and face movements.

In the absence of dopamine, another area of the brain known as the 'globus pallidus' becomes overactive.

The overactivity of the 'globus pallidus' leads to some of the symptoms seen in PD. It leads to, among other symptoms:

Excessive rigidity,

Slowing,

Tremors.

Other symptoms of PD include:

Inability to move, or freezing,

Excessive sweating,

Difficulty swallowing,

Drooling,

Slurred speech,

Abnormal movements, or dyskinesias.

These dyskinesias are generally attributed to the medications.

Some patients may also develop dementia, a progressive worsening of the memory.

Other Treatments
The cornerstone of Parkinson's disease treatment is medical.

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Many oral medications, such as levodopa have been developed to help control the symptoms of PD.

If the medication is not successful in controlling the symptoms, surgery may be considered.

The following symptoms can be helped by the operation:

Rigidity,

Abnormal movements known as dyskinesia,

Tremors can be improved.

Freezing and falling can also be reduced, but to a lesser degree. Other symptoms such as slurred speech are not helped.

Good candidates for the surgery are patients who are younger than 70 years and are otherwise healthy. Patients with dementia are not good candidates.

The aim of the operation is to destroy, or lesion, a part of the 'globus pallidus'. This operation is called a 'pallidotomy'.

The left side of the brain controls the right side of the body and vice-versa.

Therefore, a patient with severe symptoms in the right are might benefit from a pallidotomy in the left part of the brain.

If a pallidotomy is needed for both sides of the brain, the operation is performed at different times. The first pallidotomy is done to help the side with the worst symptoms.

Procedure

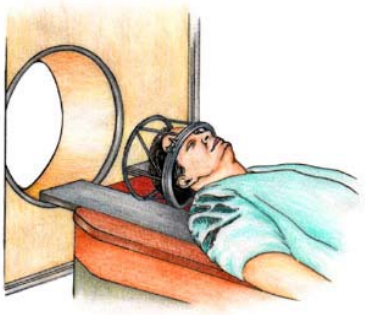
This operation is usually done under local anesthesia, or numbing of the scalp, much like the anesthesia the dentist uses to numb the mouth.

The pallidotomy is done using a special method known as stereotaxy. Stereotactic means accurate localization of the abnormality or target in space, much like we identify cities on earth using longitude and latitude measurements.

To determine the exact location of the globus pallidus the patient's head is fixed in a contraption that looks like a birdcage. This is known as a 'stereotactic frame'.

The frame is fixed to the skull with four pins; these are anchored to the skull through the skin under local anesthesia. There may be some initial discomfort after the frame is fixed. However, this improves quickly with pain and discomfort disappearing.

An MRI scan is then done. Data from that scan is then entered in a computer to help determine the exact location of the globus pallidus.



The patient is then taken to the operating room, where a small area of the head is shaved. A small incision is then performed under local anesthesia.

A hole in the skull is then drilled, and a special needle, known as an electrode, is advanced to the globus pallidus using the data taken from the computer. This is a very precise operation.

Microelectrode recording from the brain will then be performed to obtain a more precise location of the globus pallidus than can be obtained from the MRI scan alone.

Stimulation of the brain with low-level currents is also performed. This helps determine that the electrode is not close to important structures in the brain responsible for movement or vision.

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At this time the patient may experience twitching of the face or arm, or leg, or may even see flashes of light.

The needle may need to be repositioned few times before the surgeon finds the best location to perform the lesion. Once the target area is reached, a special electric current generator is then used to burn a few small lesions in the globus pallidus. This is done by raising the temperature of the tip of the electrode for a definite time. There is no pain or discomfort during the lesion process.

In some cases, the patient improves dramatically while still in the operating room.

During the operation, the surgeon monitors the neurological function of the patient. The patient is intermittently asked to answer questions and move his or her arms and legs.

Once the surgeon is satisfied with the results, the stereotactic frame is taken off, and the patient is taken to the recovery room for further observation.

Risks and Complications
The surgery is safe. There are, however, several possible risks and complications. These are unlikely, but possible.

You need to know about them just in case they happen. By being informed, you may be able to help your doctor detect complications early.

The risks and complications include those related to anesthesia and those related to any type of surgery.

Risks related to local anesthesia include possible allergic reactions to the anesthesia used. These risks will be discussed with you in greater detail by your anesthesiologist or nurse anesthetist.

Some of the risks are seen in any type of surgery. These are rare and include:

Infection, deep or at the skin level. Deep infections may involve the brain or the fluid that circulates around the spinal cord and brain. This is known as abscess or meningitis. Treating deep infections may require long-term antibiotics and possibly surgery.

Bleeding, either during or after the operation. This may necessitate a blood transfusion and another operation to take a blood clot out.

Skin scars.

Other risks and complications are related specifically to this procedure.
These again are very rare. However, it is important to know about them.

Strokes and bleeding inside the brain could lead to paralysis and even death. This is rare.

Another operation may be needed to remove blood clots that can happen after the operation.

Speech problems can occur with pallidotomy on the left side, or dominant hemisphere, where the language center is located. These are not frequent.

Partial blindness can also occur.

The operation may not help the symptoms, or may even make them worse and cause weakness on the opposite side of the body.

Some patients may also undergo the operation on the opposite side at a later date. When this is done there are some risks of speech problems that may not improve with time. To reduce the risk of this potential complication, the two operations are done at different times. The size of the lesion on the opposite side is also kept smaller.

After the Surgery
Patients may spend a day or two in the hospital for close observation. Your doctor will discuss this with you in more detail.

After the operation, you will resume the oral medications.

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Summary

Pallidotomies are usually successful in reducing some, but not all the symptoms of Parkinson's disease.

This operation is safe. Risks and complications are not frequent. Knowing about them will help you detect and treat them early.

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